REMARKS

The Applicants request reconsideration of the rejection.

Claims 15-34 remain pending.

Claims 15, 17, 20-21, 23-27, 29-30, and 32-34 were rejected under 35 U.S.C. §103(a) as being unpatentable over Griffin, et al., US 6,005,267 (Griffin). The Applicants traverse as set forth below.

In consequence of the current density J of a forward current flowing between the gate electrode-semiconductor Schottky junction increasing exponentially at or near a point Vf where the gate voltage V goes beyond the Schottky barrier Φ_B (i.e., the gate current rapidly increases with an increase in gate voltage), one sees that Vf is strongly related to Φ_B -- the greater Φ_B, the larger Vf. Accordingly, one might expect that the use of materials with large values of Φ_B for the gate electrode would be effective in order to increase Vf, and thereby to increase the range of application of the gate voltage exhibiting amplification functionality. In fact, however, Φ_B does not vary in accordance with the kind of metal used for the gate electrode (that is, the work function of the metal), and thus Φ_B remains almost constant. As a result, the prior art has been unable to increase the gate voltage applicable range by increasing Vf, which in turn has made it difficult to provide a sufficient drain current for improvement in output or gain of the amplifier system during

high-frequency operation of a mobile communication terminal. In addition, as the range of the gate voltage becomes more narrow, the stability of the gate bias voltage significantly affects the signal-to-noise ration, whereby the stability of the power supply voltage becomes nearly critical.

The present invention improves upon the prior art and reduces or substantially solves the noted problems by providing a power amplifier system including a Schottky barrier gate metal semiconductor field effect transistor ("MESFET") having source, drain, and gate electrodes, wherein the gate electrode is formed on a semiconductor region so as to form a Schottky diode between the gate electrode and the semiconductor region, and a gate current flows as a forward direction current of the Schottky diode by increasing the gate bias voltage. The materials of the gate electrode and the semiconductor region are chosen so that the gate bias voltage defined by a gate current value of 100 μA per gate electrode width of 100 μm is greater than or equal to 0.65 V. At this value for Vf (0.65 V), the gate bias voltage exceeds the top Vf of 0.6 V achievable by the prior art using the typical gate electrode of tungsten silicide formed on GaAs.

In sum, the invention, as claimed, permits Vf to be greater than or equal to a value (0.65 V) unattainable in the prior art, thereby widening or expanding the range of the gate

voltage capable of being applied as an input signal, and thus increasing the amplitude of the drain current that may be derived as an amplified output.

The primary reference to Griffin is directed to solving the problem of low output power resulting from competing interests of increased breakdown voltage and increased maximum channel current of the prior art MESFET. In other words, Griffin teaches that the output power can be maximized by giving the MESFET both a large voltage swing and a large current swing, but that the means to achieving these large swings (increasing breakdown voltage and increasing maximum channel current, respectively) are at odds with each other. To solve this problem, Griffin provides a combination MIS/MES FET having a split gate, wherein the MIS gate allows the carrier density within a selected portion of the device's channel region to be controlled, thereby increasing the breakdown voltage of the FET and enabling the FET to be operated with a higher maximum channel current and a higher drain-to-source voltage.

In achieving the objective of higher output power in this way, Griffin specifically aims away from the objective of the present invention. Namely, whereas Griffin seeks to increase the breakdown (i.e., reverse) gate voltage (gate-to-drain) of the MESFET, the invention seeks to increase the <u>forward</u> direct current gate voltage Vf to achieve the different goal of

expanding the input signal range. The Applicants thus respectively submit that the person of ordinary skill in the art would not find it obvious to modify the structural teachings of Griffin to achieve the different inventive goal in a different way.

In this regard, the Applicants note that the passage noted by the Examiner (column 7, lines 17-20) is part of a larger passage describing the relationship between the MIS gate voltage V_{MIS} and the voltage V_{GS}, and how the selection of V_{MIS} and bias voltage V_{GG} may be determined by the desired breakdown voltage and maximum channel current. The passage does not suggest how to determine the materials of the gate electrode of the MESFET gate, or even that the materials may be chosen so as to achieve a desired gate bias voltage. Moreover, the passage relates not to a MESFET per se, but to Griffin's combination MIS/MES FET, which is a different transistor. Thus, the person of ordinary skill is not led to the invention by the teachings of Griffin.

Claim 16 was rejected under 35 U.S.C. §103(a) as being unpatentable over Griffin in view of Peczalski, US 5,105,167 (Peczalski). Claims 22 and 31 were rejected under 35 U.S.C. §103(a) as being unpatentable over Griffin in view of Smith, US 6,545,563 (Smith). Neither Peczalski nor Smith, however, supplies the teachings discussed above which are also missing from Griffin. Accordingly, the combination of Griffin with

either Peczalski or Smith cannot render obvious the claimed invention.

In view of the foregoing remarks and amendments the Applicants request reconsideration of the rejection and allowance of the claims.

Respectfully submitted,

Daniel J. Stanger
Registration No. 32,846
Attorney for Applicants

MATTINGLY, STANGER & MALUR, P.C.
1800 Diagonal Road, Suite 370
Alexandria, Virginia 22314
Telephone: (703) 684-1120
Facsimile: (703) 684-1157
Date: September 27, 2004